

**COMPLIANCE WORLDWIDE INC.  
TEST REPORT 179-11R4**

In Accordance with the Requirements of  
**FCC PART 15.247, SUBPART C**  
**INDUSTRY CANADA RSS 210, ISSUE 8**  
Low Power License-Exempt Radio Communication Devices  
Intentional Radiators

Issued to  
**Revolabs, Inc.**  
**144 North Road, Suite 3250**  
**Sudbury, MA 01776**

for the  
**flx Base Unit**  
**2.4 GHz Bluetooth Transmitter**

**FCC ID: T5V10FLX**  
**IC: 6455A-10FLX**

**Original Report Issued on April 1, 2011**  
R1 issued on April 29, 2011, R2 issued on May 5, 2011  
R3 issued on August 5, 2011, R4 issued on August 24, 2011

Tested by

  
\_\_\_\_\_  
Brian F. Breault

Reviewed by

  
\_\_\_\_\_  
Larry K. Stillings

This test report shall not be reproduced, except in full, without written permission from Compliance Worldwide, Inc.

## Table of Contents

|                                                             |    |
|-------------------------------------------------------------|----|
| 1 Scope .....                                               | 3  |
| 2 Product Details .....                                     | 3  |
| 2.1 Manufacturer .....                                      | 3  |
| 2.3 Serial Number .....                                     | 3  |
| 2.4 Description .....                                       | 3  |
| 2.5 Power Source .....                                      | 3  |
| 2.6 EMC Modifications .....                                 | 3  |
| 3 Product Configuration .....                               | 3  |
| 3.1 Operational Characteristics & Software .....            | 3  |
| 3.2 EUT Hardware .....                                      | 4  |
| 3.3 Support Equipment .....                                 | 4  |
| 3.4 Cables .....                                            | 4  |
| 3.5 Block Diagram .....                                     | 5  |
| 4 Measurements Parameters .....                             | 5  |
| 4.1 Measurement Equipment Used to Perform Test .....        | 5  |
| 4.2 Measurement & Equipment Setup .....                     | 5  |
| 4.3 Measurement Procedure .....                             | 6  |
| 5 Measurement Summary .....                                 | 6  |
| 6 Measurement Data .....                                    | 7  |
| 6.1 Antenna Requirement .....                               | 7  |
| 6.2 Number of Hopping Channels .....                        | 7  |
| 6.3 Frequency Hopping Channel Separation .....              | 8  |
| 6.4 Minimum 20 dB Bandwidth .....                           | 10 |
| 6.5 Average Time of Occupancy .....                         | 12 |
| 6.6 Maximum Peak Conducted Output Power .....               | 16 |
| 6.7 Band Edge Measurements .....                            | 18 |
| 6.8 99% (Occupied) Bandwidth .....                          | 22 |
| 6.9 Combined Spurious Harmonic Radiated Emissions .....     | 24 |
| 6.10 Spurious Radiated Emissions .....                      | 25 |
| 6.11 Receiver Spurious Emissions .....                      | 29 |
| 6.12 Power Line Conducted Emissions .....                   | 31 |
| 6.13 Public Exposure to Radio Frequency Energy Levels ..... | 35 |
| 8 Test Site Description .....                               | 36 |

## 1. Scope

This test report certifies that the Revolabs, Inc. 2.4 GHz Bluetooth Transmitter, as tested, meets the FCC Part 15.247, and Industry Canada RSS 210, Issue 8 requirements. The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required. Revision R3 added lower and upper restricted band measurements. Revision R4 added spurious emissions measurements from 26 MHz to 30 MHz.

## 2. Product Details

- 2.1. Manufacturer:** Revolabs, Inc.
- 2.2. Model Number:** Base = 10-FLX2BASE-POTS; 10-FLX4BASE-POTS  
10-FLX2BASE-VOIP; 10-FLX4BASE-VOIP
- 2.3. Serial Number:** 7010F0000435
- 2.4. Description:** Bluetooth/DECT Conferencing Base Station
- 2.5. Power Source:** 5 Volts DC Power Adapter
- 2.6. EMC Modifications:** None

## 3. Product Configuration

### 3.1. Operational Characteristics & Software

CSR BlueTest3 was used as to control software for the Bluetooth transmitter. Once the software and driver were installed, the transmitter could be configured to function in a number of ways.

Note that all the default power settings set by the client were maintained throughout the testing.

TXSTART – The transmitter transmits a single carrier at a selected frequency from channel 0 to 78.

CFG HOPPING SEQ – Selects the channel(s) to be included in a hopping sequence.

TXDATA 2 – Initiates the hopping.

### 3. Product Configuration (continued)

#### 3.2. EUT Hardware

| Device           | Manufacturer | Model                                                                        | Serial No.   | Comment                                           |
|------------------|--------------|------------------------------------------------------------------------------|--------------|---------------------------------------------------|
| flx Base Station | Revolabs     | 10-FLX2BASE-POTS<br>10-FLX4BASE-POTS<br>10-FLX2BASE-VOIP<br>10-FLX4BASE-VOIP | 7010F0000465 | Used for field strength measurements <sup>1</sup> |
| flx Base Station | Revolabs     | MBT-9166                                                                     |              | Used for conducted measurements <sup>1</sup>      |
| Power Supply     | Teking       | PAS05AA-W00501000                                                            | N/A          | 5 Volt, 1 Amp supply                              |

<sup>1</sup> Two units with identical transmitters were provided for test. On one unit, the antenna cable was removed and replaced with an MMCX connector to facilitate conducted measurements.

#### 3.3. Support Equipment

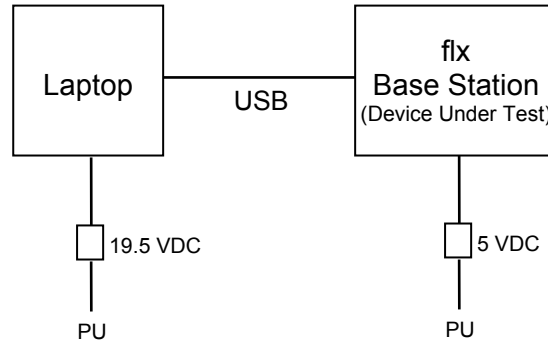
| Device | Manufacturer | Model                  | Serial No. | Comment                                           |
|--------|--------------|------------------------|------------|---------------------------------------------------|
| Laptop | Dell         | PP18L<br>Latitude D620 | 8181566785 | Used for field strength measurements <sup>1</sup> |

#### 3.4. Cables

| Part # | Shielded Y or N | Length | Function / Description |
|--------|-----------------|--------|------------------------|
| N/A    | Y               | 1 m    | USB to Micro USB       |

### 3. Product Configuration (continued)

#### 3.5. Block Diagram



### 4. Measurements Parameters

#### 4.1. Measurement Equipment Used to Perform Test

| Device              | Manufacturer    | Model No.  | Serial No. | Cal Due    |
|---------------------|-----------------|------------|------------|------------|
| Spectrum Analyzer   | Agilent         | E4407B     | MY45104493 | 12/22/2012 |
| Microwave Preamp    | Hewlett Packard | 83050A     | 3331A00404 | 10/20/2011 |
| Spectrum Analyzer   | Agilent         | E7405A     | MY45115430 | 10/22/2011 |
| Loop Antenna        | EMCO            | 6502       | 2197       | 7/22/2012  |
| Bilog Antenna       | Com-Power       | AC-220     | 25509      | 8/30/2011  |
| Horn Antenna        | Electro-Metrics | EM-6961    | 6337       | 10/19/2012 |
| Horn Antenna        | ComPower        | AH-118     | 10078      | 7/23/2011  |
| Horn Antenna        | ComPower        | AH-840     | 03075      | 7/20/2012  |
| DMM / Temperature   | Fluke           | 187        | 79690058   | 11/29/2011 |
| RF Signal Generator | Hewlett Packard | 8648C      | 3642U01557 | 7/16/2011  |
| 2.4 GHz BP Filter   | Micro-Tronics   | BRM50702   | 14         | 8/11/2011  |
| RF Power Meter      | Boonton         | 4220A      | 203603AA   | 5/28/2012  |
| Power Sensor        | Boonton         | 51100 (9E) | 24221      | 5/29/2012  |
| Digital Barometer   | Control Company | 4195       | ID236      | 11/9/2011  |

#### 4.2. Measurement & Equipment Setup

|                                       |                                                          |
|---------------------------------------|----------------------------------------------------------|
| Test Dates:                           | Mar. 15 <sup>th</sup> 2011 – Mar 31 <sup>th</sup> , 2011 |
| Test Engineer:                        | Brian Breault                                            |
| Normal Site Temperature (15 - 35°C):  | 21.6                                                     |
| Relative Humidity (20 -75%RH):        | 35                                                       |
| Frequency Range:                      | 30 MHz to 40 GHz                                         |
| Measurement Distance:                 | 3 Meters                                                 |
| EMI Receiver IF/Resolution Bandwidth: | 100 kHz - 30 MHz to 1 GHz                                |
|                                       | 1 MHz - Above 1 GHz                                      |
| EMI Receiver Average/Video Bandwidth: | 300 kHz - 30 MHz to 1 GHz                                |
|                                       | 3 MHz - Above 1 GHz                                      |
| Detector Function:                    | Peak, Quasi-Peak & Average                               |

#### 4. Measurements Parameters

##### 4.3. Measurement Procedure

Test measurements were made in accordance FCC Part 15.247, IC RSS-210 Annex II: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.

The test methods used to generate the data in this test report is in accordance with ANSI C63.4: 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

The device under test is not a handheld device. Rotating the device through three orthogonal axes in accordance with ANSI C63.4-2003, section 13.1.4.1, c) was not required.

#### 5. Measurements Summary

| Test Requirement                                 | FCC Rule Requirement     | IC Rule Requirement    | Report Section | Result    |
|--------------------------------------------------|--------------------------|------------------------|----------------|-----------|
| Antenna Requirement                              | 15.203                   | RSS-GEN 7.1.2          | 6.1            | Compliant |
| Number of hopping channels                       | 15.247 (a) (1) (iii)     | RSS-210 A8.1 (d)       | 6.2            | Compliant |
| Hopping channel carrier frequency separation     | 15.247 (a) (1)           | RSS-210 A8.1 (b)       | 6.3            | Compliant |
| Minimum 20 dB bandwidth                          | 15.247 (a) (1) (iii)     | RSS-210 A8.1 (b)       | 6.4            | Compliant |
| Average time of occupancy                        | 15.247 (a) (1) (iii)     | RSS-210 A8.1 (d)       | 6.5            | Compliant |
| Maximum peak conducted output power              | 15.247 (b) (1)           | RSS-210 A8.1 (b)       | 6.6            | Compliant |
| Band edge                                        | 15.247 (d)               | RSS-210 A8.5           | 6.7            | Compliant |
| 99% (occupied) bandwidth                         | N/A                      | RSS-GEN 4.6.1          | 6.8            | Compliant |
| Spurious harmonic radiated emissions             | ANSI C63.4 10.2.8.2      | RSS-210 A8.9           | 6.9            | Compliant |
| Spurious radiated emissions                      | 15.209                   | RSS-GEN                | 6.10           | Compliant |
| Receiver Spurious Radiated Emissions             |                          | RSS-GEN 4.10           | 6.11           | Compliant |
| Power line conducted emissions                   | 15.207                   | RSS-GEN                | 6.12           | Compliant |
| Public exposure to radio frequency energy levels | 15.247 (1) 1.1307 (b)(1) | RSS-GEN 5.5<br>RSS-102 | 6.13           | Compliant |

## 6. Measurement Data

### 6.1. Antenna Requirement (15.203, RSS-GEN 7.1.2)

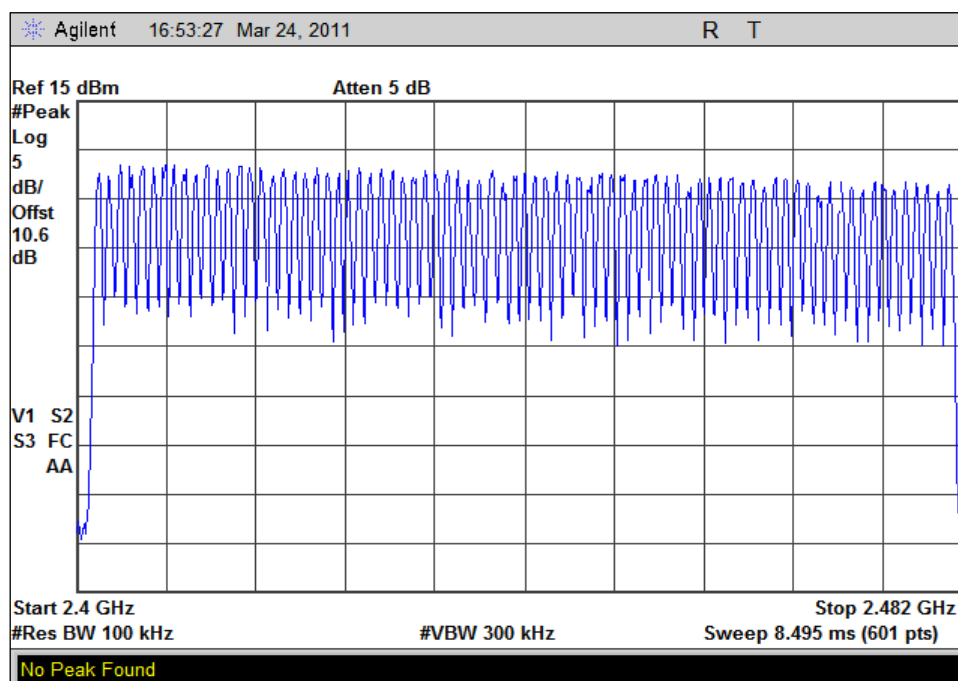
Requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

Status: The antenna module is connected to the transmitter module by a short length of coax cable soldered both ends

### 6.2. Number of Hopping Channels (15.247 (a) (1) (iii), RSS-210 A8.1 (d))

Requirement: Systems Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Status: The device under test utilizes 79 hopping channels from 2402 MHz to 2480 MHz.



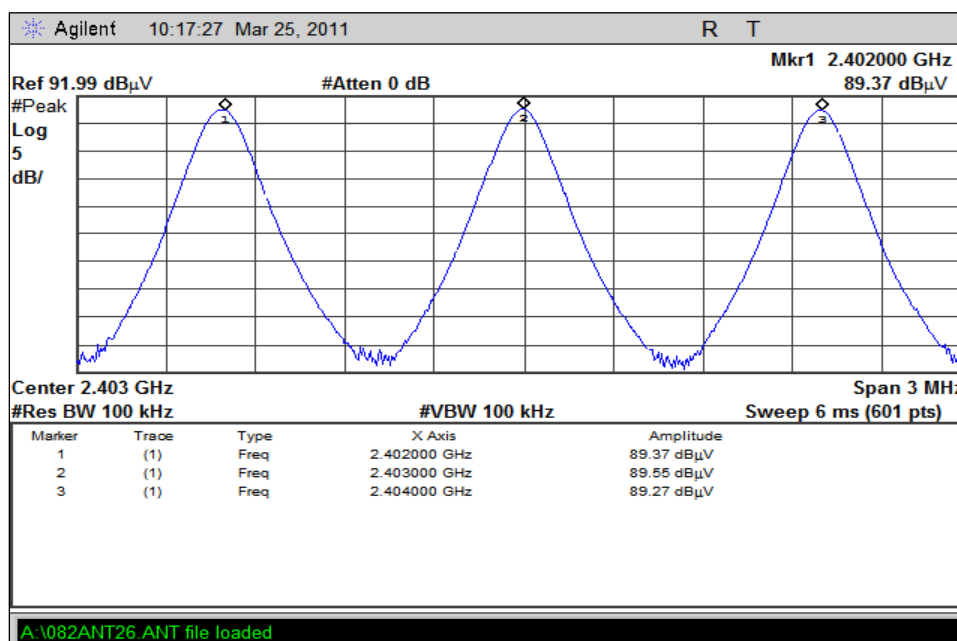
Result: Compliant

## 6. Measurement Data

### 6.3. Frequency Hopping Channel Separation (15.247 (a) (1), RSS-210 A8.1 (b))

| Channel Pair | Channel Pair | Channel Separation (kHz) | Required Channel Separation (kHz) | Result    |
|--------------|--------------|--------------------------|-----------------------------------|-----------|
| Low          | 2402         | 1000                     | >807                              | Compliant |
|              | 2403         |                          |                                   |           |
| Middle       | 2440         | 1000                     | >857                              | Compliant |
|              | 2441         |                          |                                   |           |
| High         | 2479         | 1000                     | >793                              | Compliant |
|              | 2480         |                          |                                   |           |

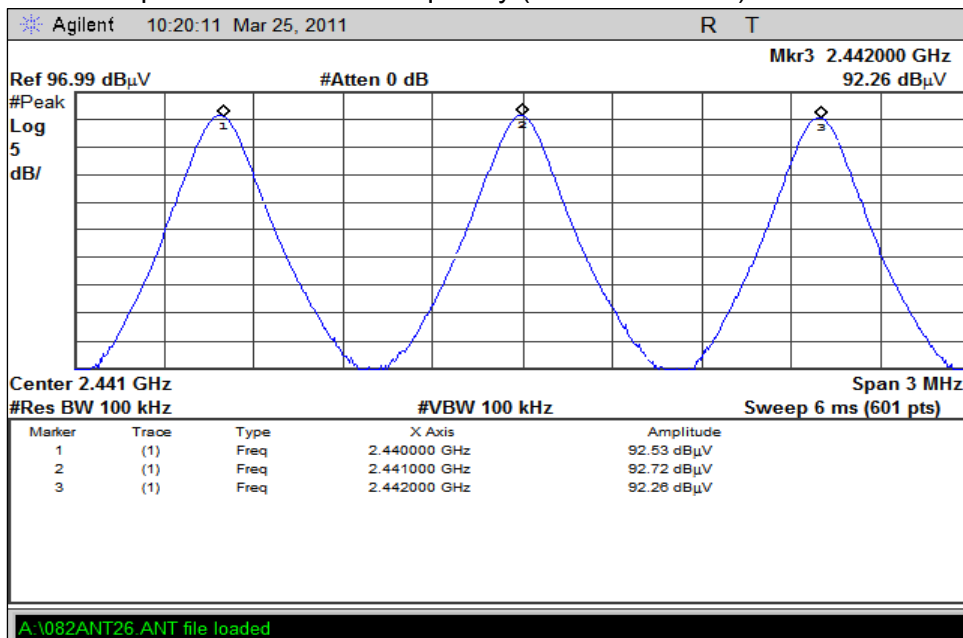
#### 6.3.1. Channel Separation – Low Frequency (2402/2403 MHz)



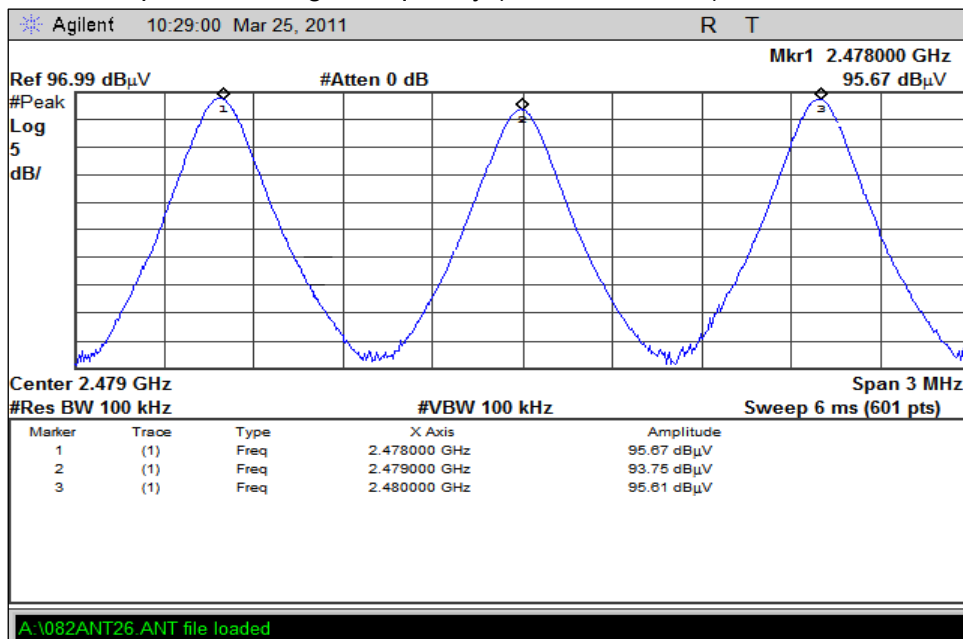
## 6. Measurement Data

### 6.4. Frequency Hopping Channel Separation (15.247 (a) (1), RSS-210 A8.1 (b))

#### 6.3.2. Channel Separation – Middle Frequency (2441/2442 MHz)



#### 6.3.3. Channel Separation – High Frequency (2479/2480 MHz)



## 6. Measurement Data

### 6.4. Minimum 20 dB Bandwidth (15.247 (a) (1), RSS-210 A8.1 (b))

Requirement: Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Resolution Bandwidth: 30 kHz  
Video Bandwidth : 100 kHz

| Channel | Frequency (MHz) | -20 dB Bandwidth (kHz) |
|---------|-----------------|------------------------|
| Low     | 2402            | 807.0                  |
| Middle  | 2441            | 857.0                  |
| High    | 2480            | 793.0                  |

#### 6.4.1. 20 dB Bandwidth – Low Frequency (2402 MHz)



## 6. Measurement Data

### 6.4. Minimum 20 dB Bandwidth (15.247 (a) (1), RSS-210 A8.1 (b))

#### 6.4.2. 20 dB Bandwidth – Middle Frequency (2441 MHz)



#### 6.4.3. 20 dB Bandwidth – High Frequency (2480 MHz)



## 6. Measurement Data

### 6.5. Average Time of Occupancy (15.247 (a) (1) (iii), RSS-210 A8.1 (d))

Requirement: The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

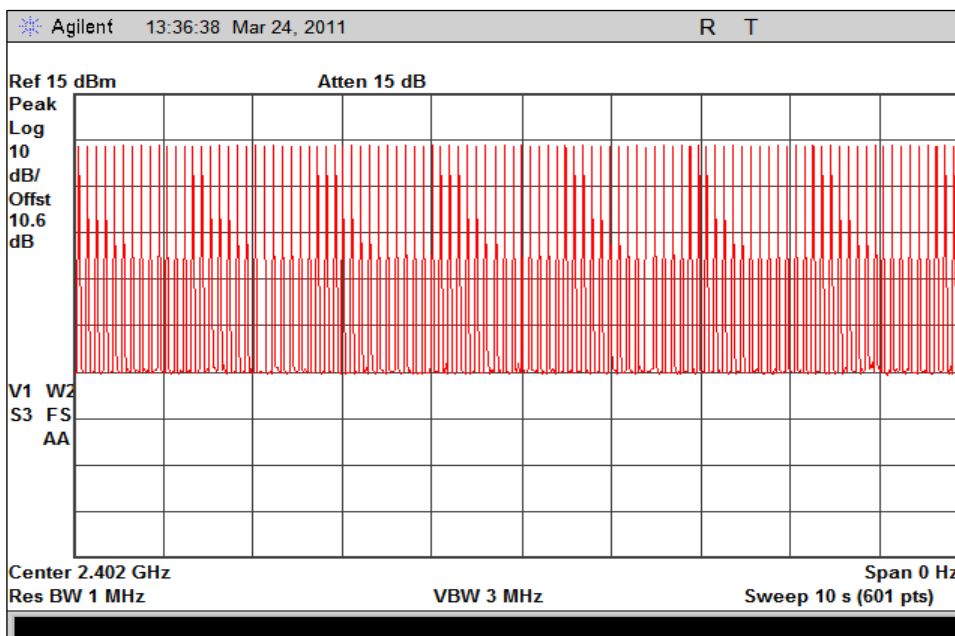
Test Note: A sweep time of 10 seconds was used to facilitate counting the pulses on a given frequency. This number was multiplied by 3.2 to determine the number of pulses in a 32 second interval.

$$79 \text{ Channels} \times 0.4 \text{ Seconds} = 32 \text{ Seconds}$$

| Channel | Frequency (MHz) | Number of Pulses per 10s Period | Number of Pulses per 32s Period | Pulse Width (μS) | Dwell Time per Period (32 Seconds) | Maximum Dwell Time per Period | Result    |
|---------|-----------------|---------------------------------|---------------------------------|------------------|------------------------------------|-------------------------------|-----------|
| Low     | 2402            | 101                             | 323                             | 390              | 0.1260                             | 0.4                           | Compliant |
| Middle  | 2441            | 101                             | 323                             | 390              | 0.1260                             | 0.4                           | Compliant |
| High    | 2480            | 101                             | 323                             | 385              | 0.1244                             | 0.4                           | Compliant |

#### 6.5.1. Pulses per 10 Second Period

##### 6.5.1.1. Pulses per 10 Second Period – Low Frequency (2402 MHz)

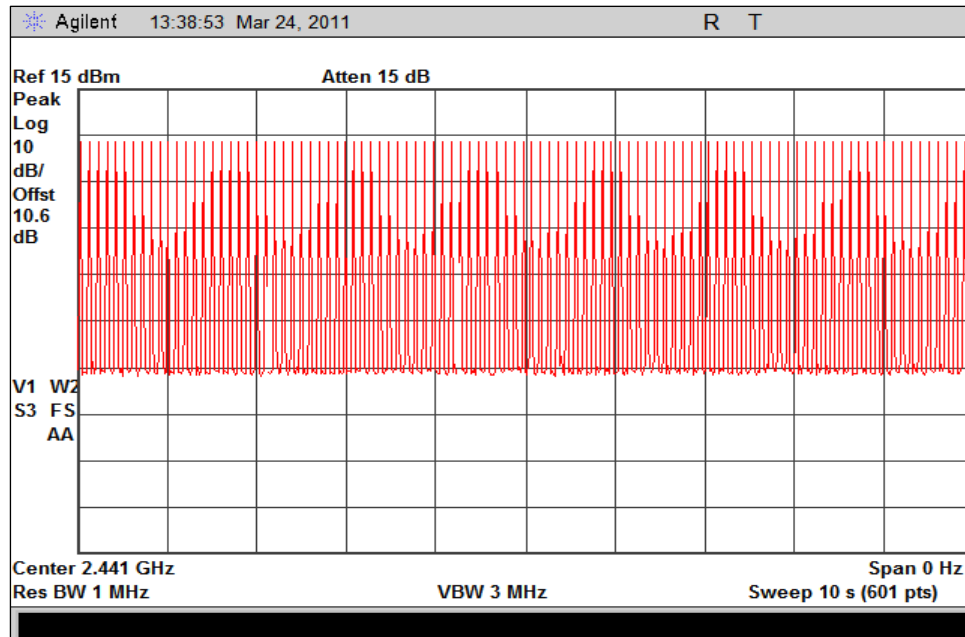


## 6. Measurement Data

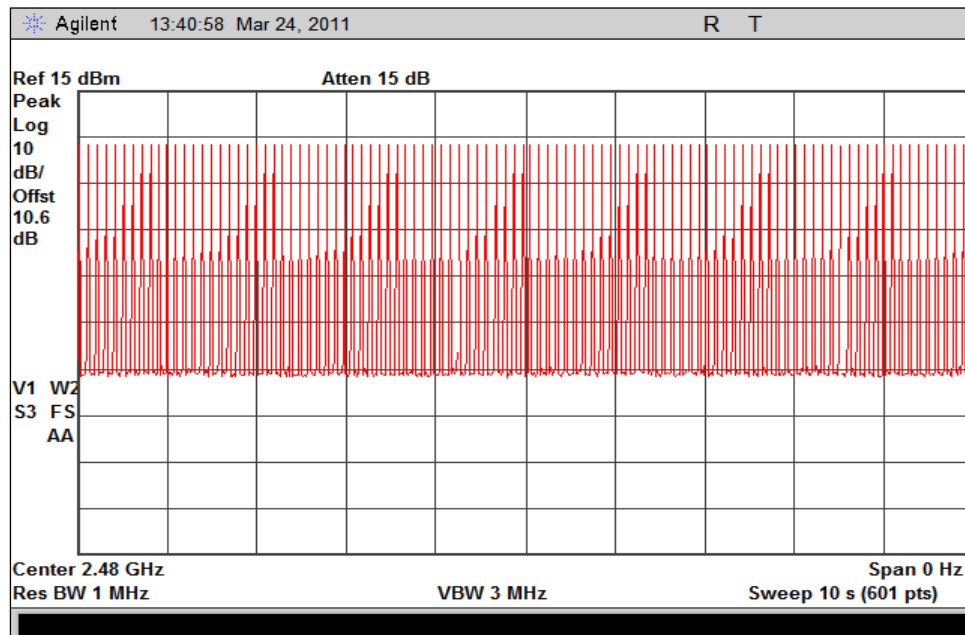
### 6.5. Average Time of Occupancy (15.247 (a) (1) (iii), RSS-210 A8.1 (d))

#### 6.5.1. Pulses per 10 Second Period (continued)

##### 6.5.1.2. Pulses per 10 Second Period – Middle Frequency (2441 MHz)



##### 6.5.1.3. Pulses per 10 Second Period – High Frequency (2480 MHz)

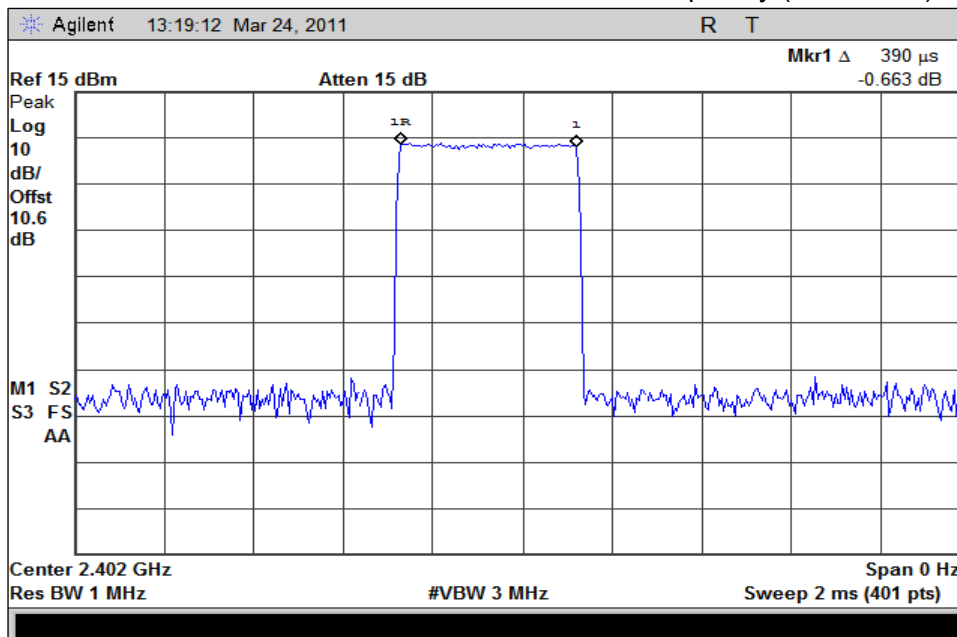


## 6. Measurement Data

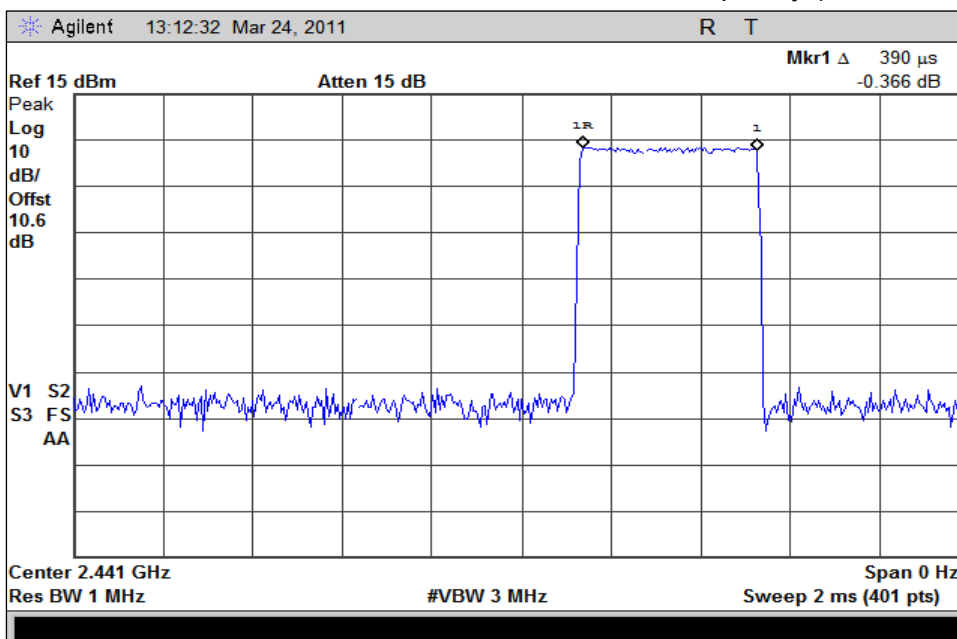
### 6.5. Average Time of Occupancy (15.247 (a) (1) (iii), RSS-210 A8.1 (d))

#### 6.5.2. Transmitter Individual Pulse Width

##### 6.5.2.1. Transmitter Individual Pulse Width – Low Frequency (2402 MHz)



##### 6.5.2.2. Transmitter Individual Pulse Width – Middle Frequency (2441 MHz)

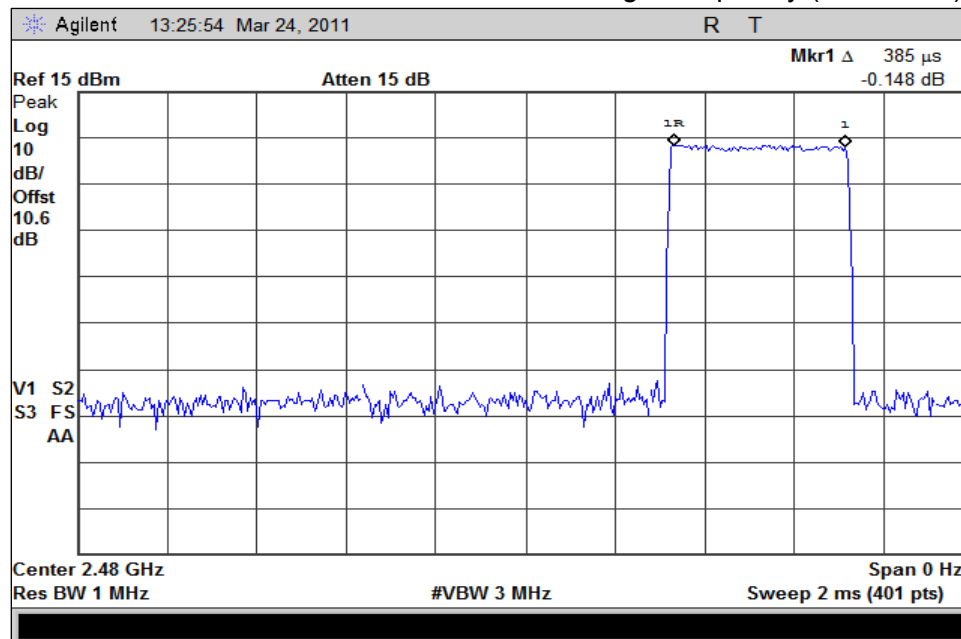


## 6. Measurement Data

### 6.5. Average Time of Occupancy (15.247 (a) (1) (iii), RSS-210 A8.1 (d))

#### 6.5.2. Transmitter Individual Pulse Width (continued)

##### 6.5.2.3. Transmitter Individual Pulse Width – High Frequency (2480 MHz)



### 6.5. Maximum Peak Conducted Output Power (15.247 (b) (1), RSS-210 A8.1 (b))

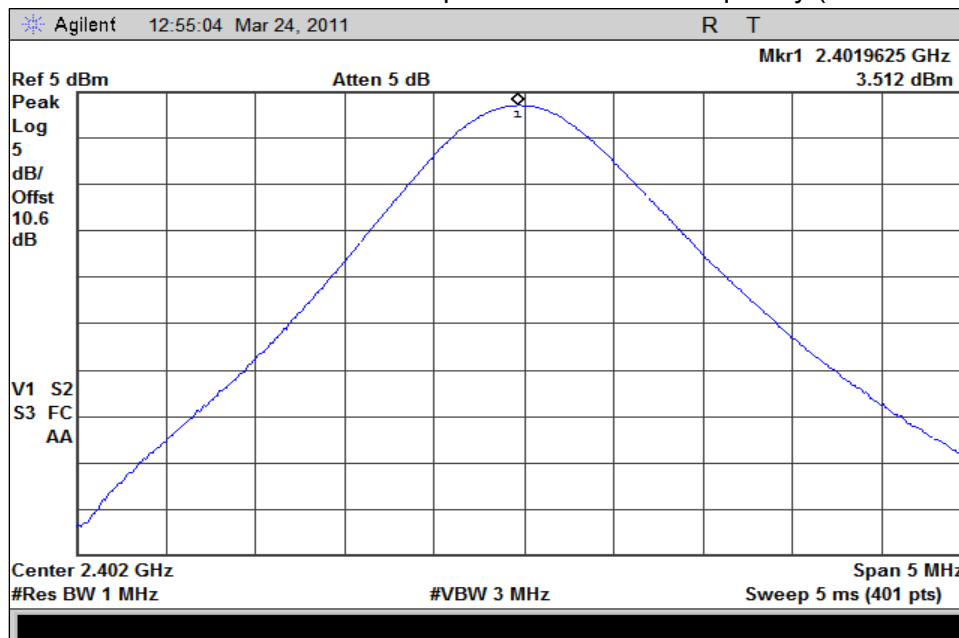
Requirement: The maximum peak conducted output power of the intentional radiator shall not exceed 1 watt for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels.

| Channel | Channel Frequency (MHz) | Max Peak Output Power (Watts) | Limit (Watts) | Result    |
|---------|-------------------------|-------------------------------|---------------|-----------|
| Low     | 2402                    | 0.0022                        | 1             | Compliant |
| Middle  | 2441                    | 0.0021                        | 1             | Compliant |
| High    | 2480                    | 0.0021                        | 1             | Compliant |

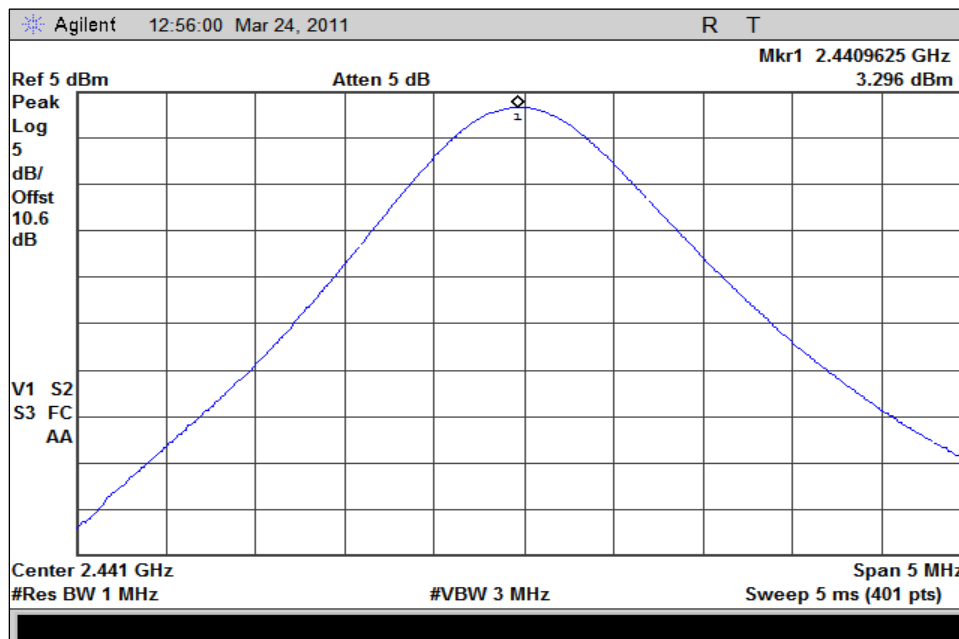
## 6. Measurement Data

### 6.6. Maximum Peak Conducted Output Power (15.247 (b) (1), RSS-210 A8.1 (b))

#### 6.6.1. Maximum Peak Conducted Output Power – Low Frequency (2402 MHz)



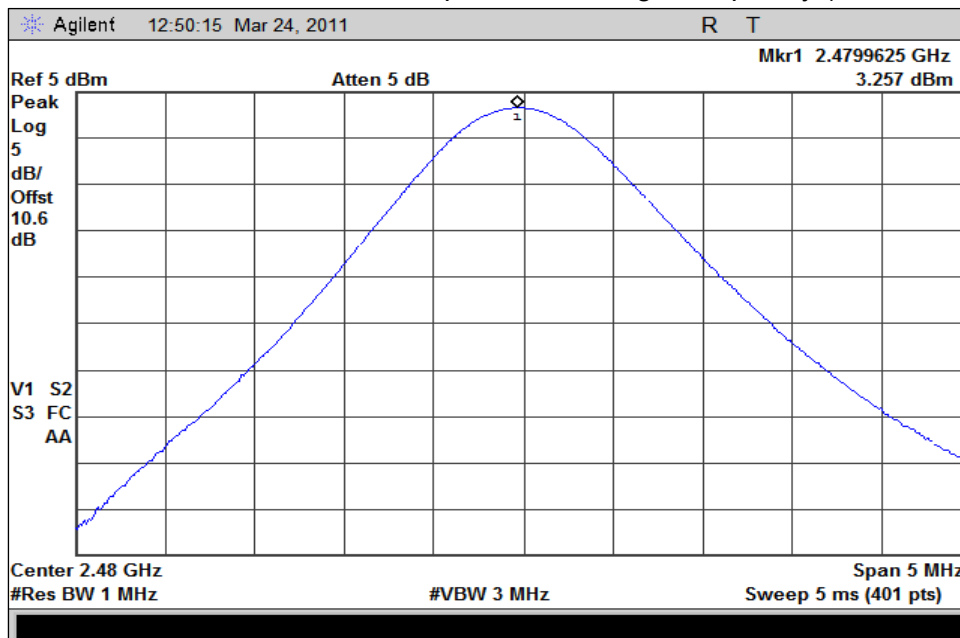
#### 6.6.2. Maximum Peak Conducted Output Power – Middle Frequency (2441 MHz)



## 6. Measurement Data

### 6.6. Maximum Peak Conducted Output Power (15.247 (b) (1), RSS-210 A8.1 (b))

#### 6.6.3. Maximum Peak Conducted Output Power – High Frequency (2480 MHz)



## 6. Measurement Data

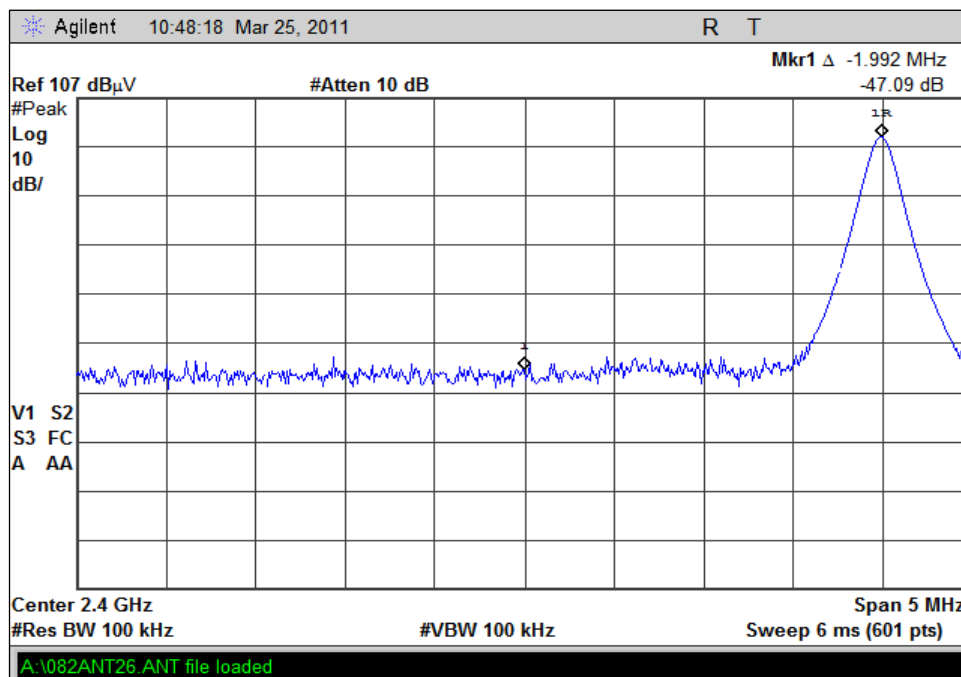
### 6.7. Band Edge (15.247 (d), RSS-210 A8.5)

Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

#### 6.7.1. Lower Band Edge

##### 6.7.1.1. Unmodulated Carrier

| Lowest Channel<br>(MHz) | Field Strength<br>(dBμV/m) |         | Band Edge Frequency<br>(MHz) | Field Strength<br>(dBμV/m) |         | Limit  | Margin<br>(dB) | Result    |
|-------------------------|----------------------------|---------|------------------------------|----------------------------|---------|--------|----------------|-----------|
|                         | Peak                       | Average |                              | Peak                       | Average |        |                |           |
| 2402.                   | 98.68                      | ---     | 2400                         | 51.59                      | ---     | >20 dB | -47.09         | Compliant |



Test Number: 179-11R4

Issue Date: 8/24/2011

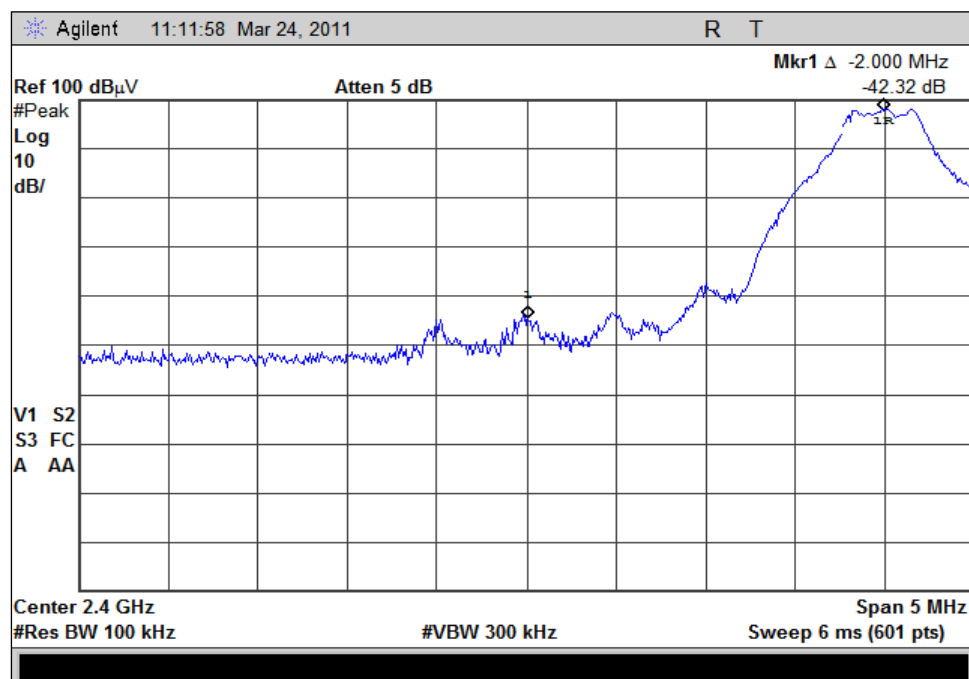
## 6. Measurement Data (continued)

### 6.7. Band Edge (15.247 (d), RSS-210 A8.5)

#### 6.7.1. Lower Band Edge

##### 6.7.1.2. Frequency Hopping

| Lowest Channel | Field Strength (dBm) |         | Band Edge Frequency (MHz) | Field Strength (dBm) |         | Limit  | Margin (dB) | Result    |
|----------------|----------------------|---------|---------------------------|----------------------|---------|--------|-------------|-----------|
|                | Peak                 | Average |                           | Peak                 | Average |        |             |           |
| 2402.          | 98.68                | ---     | 2400                      | 56.36                | ---     | >20 dB | -42.32      | Compliant |



## 6. Measurement Data

### 6.7. Band Edge (15.247 (d), RSS-210 A8.5)

#### 6.7.2. Upper Band Edge

##### 6.7.2.1. Unmodulated Carrier

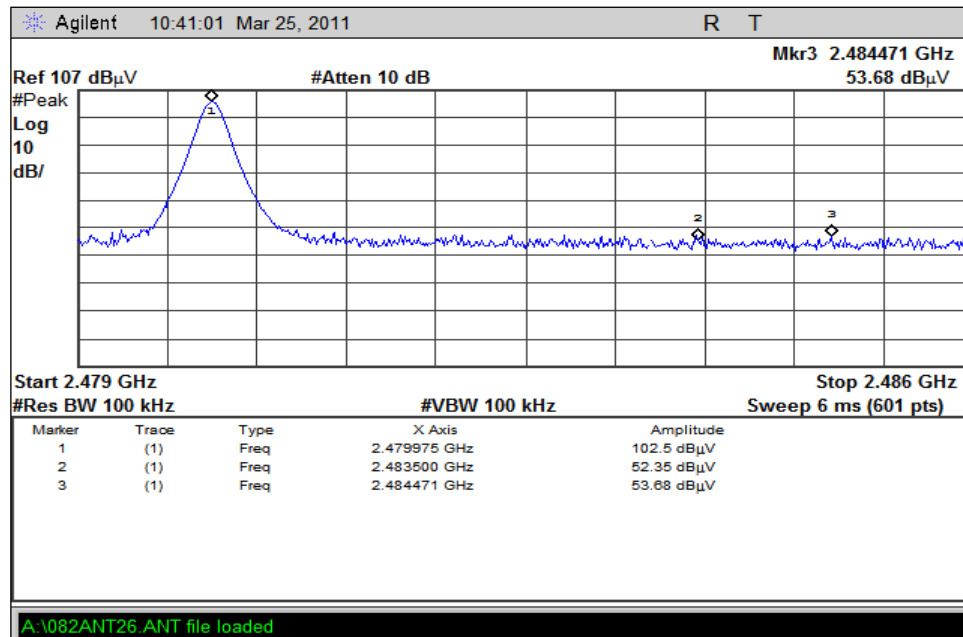
##### Band Edge

| Highest Channel | Field Strength<br>(dBμV/m) |                      | Band Edge Frequency | Field Strength<br>(dBμV/m) |                      | 15.209 Limit<br>(dB) | Margin<br>(dB) | Result    |
|-----------------|----------------------------|----------------------|---------------------|----------------------------|----------------------|----------------------|----------------|-----------|
| (MHz)           | Peak                       | Average <sup>1</sup> | (MHz)               | Peak                       | Average <sup>1</sup> | Average              |                |           |
| 2480            | 102.50                     | N/A                  | 2483.5              | 52.35                      | N/A                  | 54                   | -1.65          | Compliant |

##### Worst-case Out of Band

| Frequency | Field Strength<br>(dBμV/m) |                      | 15.209 Limit<br>(dB) | Margin<br>(dB) | Result    |
|-----------|----------------------------|----------------------|----------------------|----------------|-----------|
| (MHz)     | Peak                       | Average <sup>1</sup> | Average <sup>1</sup> | Average        |           |
| 2483.578  | 53.68                      | N/A                  | 54                   | -0.32          | Compliant |

<sup>1</sup> The Peak measurement meets the average limit.



## 6. Measurement Data

### 6.7. Band Edge (15.247 (d), RSS-210 A8.5)

#### 6.7.2. Upper Band Edge

##### 6.7.2.2. Modulated Carrier

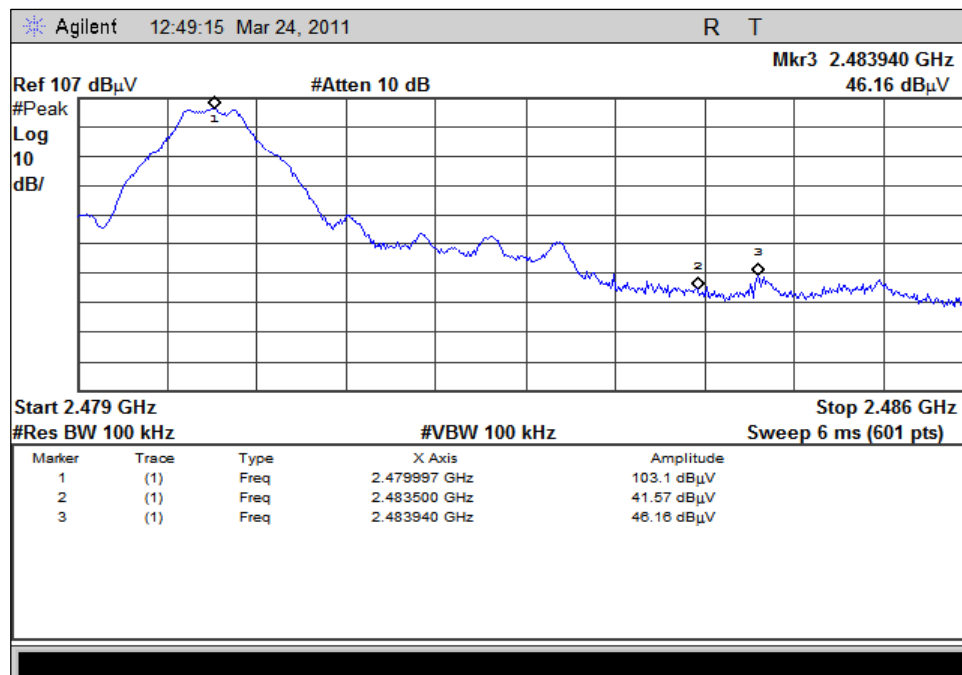
##### Band Edge

| Highest Channel | Field Strength<br>(dBμV/m) |                      | Band Edge Frequency | Field Strength<br>(dBμV/m) |                      | 15.209 Limit<br>(dB) | Margin<br>(dB) | Result    |
|-----------------|----------------------------|----------------------|---------------------|----------------------------|----------------------|----------------------|----------------|-----------|
| (MHz)           | Peak                       | Average <sup>1</sup> | (MHz)               | Peak                       | Average <sup>1</sup> | Average              |                |           |
| 2480            | 103.1                      | N/A                  | 2483.5              | 41.57                      | N/A                  | 54                   | -12.43         | Compliant |

##### Worst-case Out of Band

| Frequency | Field Strength<br>(dBμV/m) |                      | 15.209 Limit<br>(dB) | Margin<br>(dB) | Result    |
|-----------|----------------------------|----------------------|----------------------|----------------|-----------|
| (MHz)     | Peak                       | Average <sup>1</sup> | Average <sup>1</sup> | Average        |           |
| 2483.940  | 46.16                      | N/A                  | 54                   | -7.84          | Compliant |

<sup>1</sup> The Peak measurement meets the average limit.



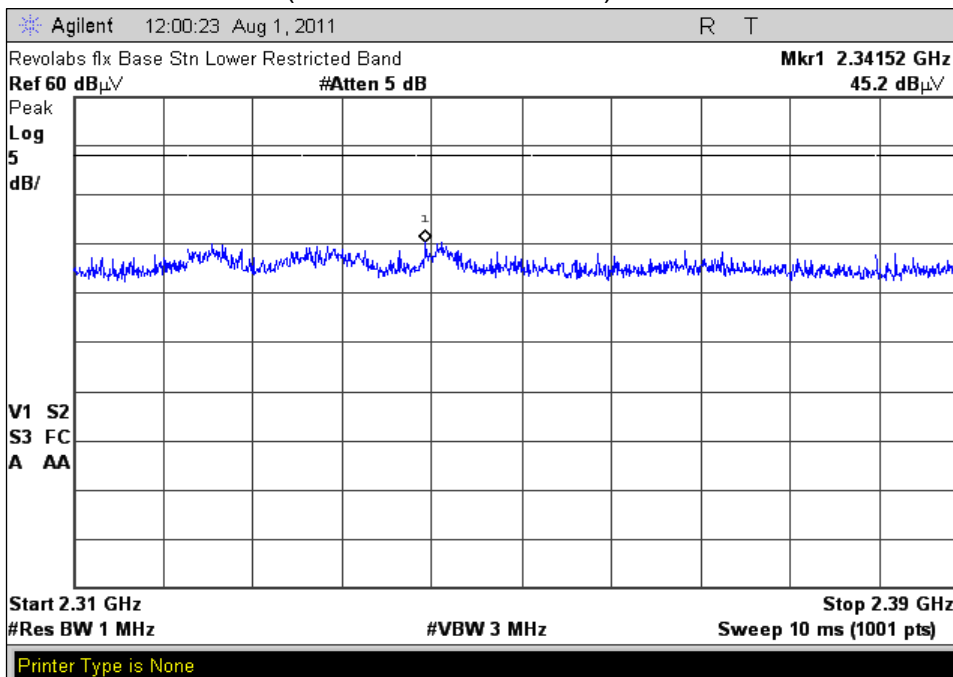
Test Number: 179-11R4

Issue Date: 8/24/2011

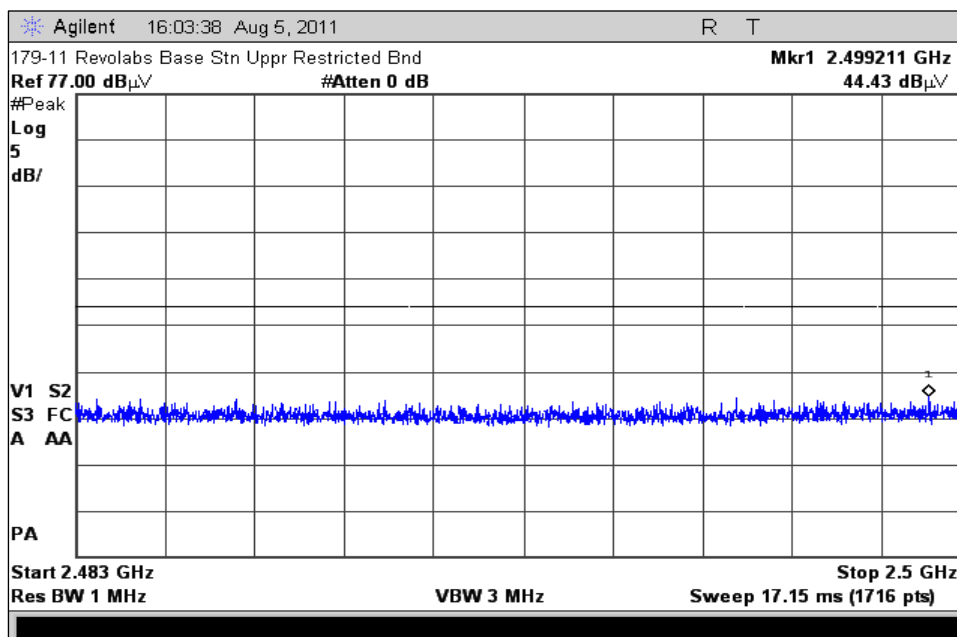
## 6. Measurement Data

### 6.7. Band Edge (15.247 (d), RSS-210 A8.5)

#### 6.7.3. Lower Restricted Band (2310 MHz to 2390 MHz)



#### 6.7.4. Upper Restricted Band (2483.5 MHz to 2500 MHz)



## 6. Measurement Data (continued)

### 6.8. 99% (Occupied) Bandwidth (RSS-GEN 4.6.1)

Requirement: For devices operating above 900 MHz, the 99% bandwidth shall be no wider than 0.5% of the center frequency.

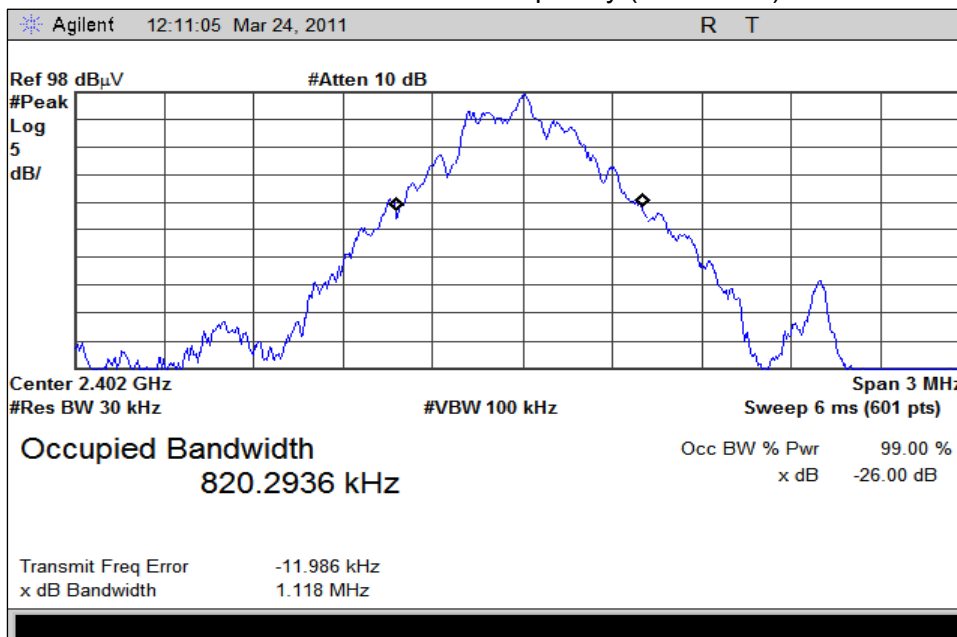
The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

Resolution Bandwidth: 30 kHz  
Video Bandwidth : 100 kHz

#### 6.8.1. Measurement Results

| Channel | Channel Frequency (MHz) | 99% Power Bandwidth (MHz) | Acceptable Bandwidth (MHz) | Result    |
|---------|-------------------------|---------------------------|----------------------------|-----------|
| Low     | 2401.060                | 0.8203                    | 12.0                       | Compliant |
| Middle  | 2442.320                | 0.8184                    | 12.2                       | Compliant |
| High    | 2482.252                | 0.8346                    | 12.4                       | Compliant |

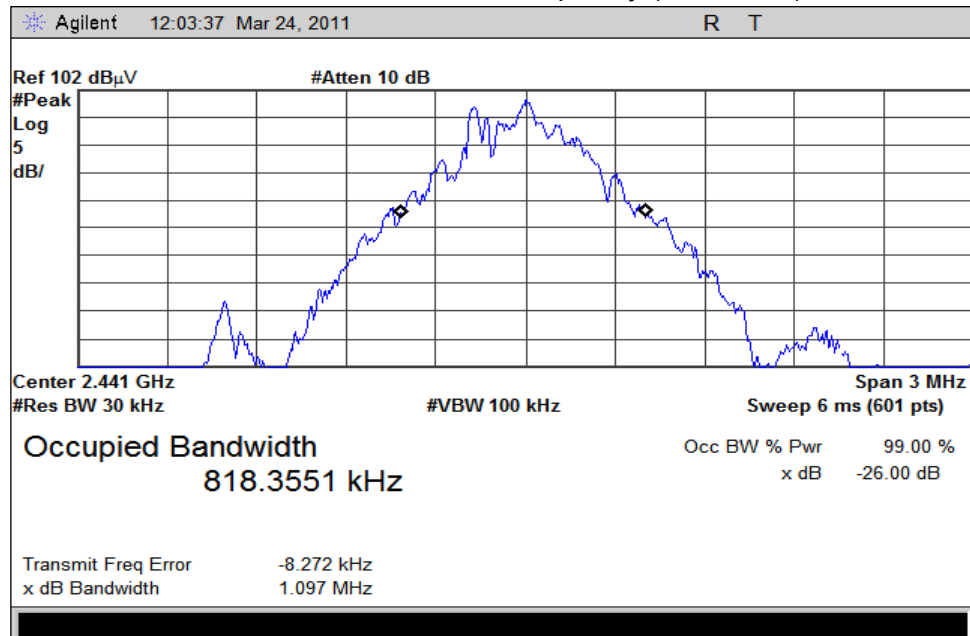
#### 6.8.1.1. 99% Power Bandwidth – Low Frequency (2402 MHz)



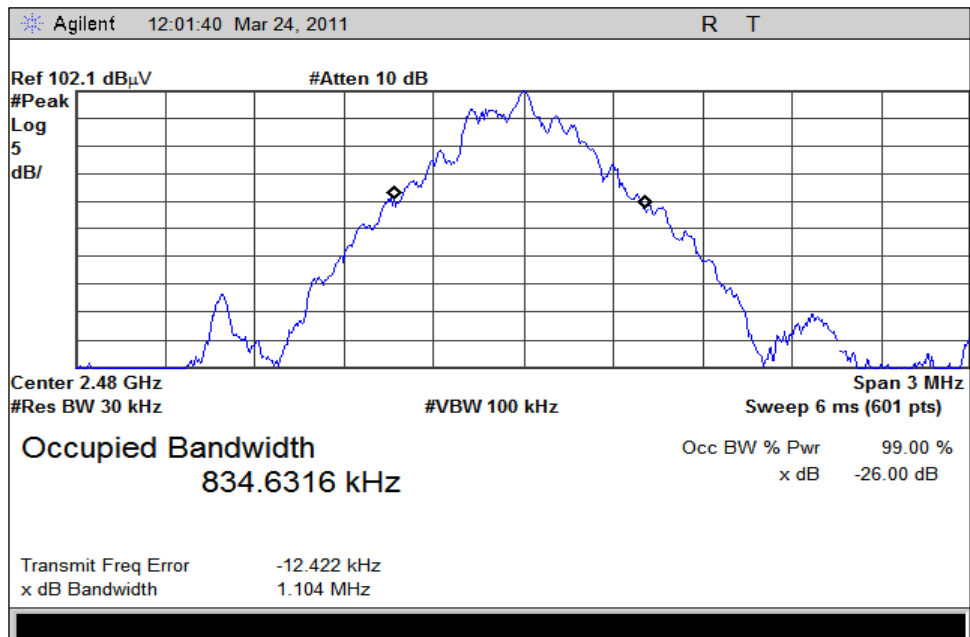
## 6. Measurement Data (continued)

### 6.8. 99% Bandwidth (RSS 210)

#### 6.8.1.2. 99% Power Bandwidth – Middle Frequency (2441 MHz)



#### 6.8.1.3. 99% Power Bandwidth – High Frequency (2480 MHz)



## 6. Measurement Data (continued)

### 6.9. Combined Spurious Harmonic Radiated Emissions (ANSI C63.4 Section 10.2.8.2, RSS-210 A8.9)

Resolution Bandwidth: 1 MHz

Video Bandwidth : 3 MHz

| Frequency (MHz) | Peak (dBμV/m) <sup>1</sup> | Avg (dBμV/m) <sup>1</sup> | Limit (dB) | Margin (dB) | Pol (H/V) | Ht (cm) | TT Pos (Deg) | Notes <sup>2 &amp; 3</sup> | Results   |
|-----------------|----------------------------|---------------------------|------------|-------------|-----------|---------|--------------|----------------------------|-----------|
| 4804            | 57.54                      | 40.22                     | 54         | -13.78      | H         | 152     | 293          | LF                         | Compliant |
| 4882            | 58.65                      | 41.46                     | 54         | -12.54      | H         | 153     | 356          | MF                         | Compliant |
| 4960            | 57.91                      | 40.44                     | 54         | -13.56      | H         | 147     | 7            | HF                         | Compliant |
| 7323            | 53.86                      | 39.94                     | 54         | -14.06      | V         | 150     | 0            | MF/NF                      | Compliant |
| 7440            | 52.38                      | 39.50                     | 54         | -14.50      | V         | 100     | 0            | HF/NF                      | Compliant |
| 12010           | 56.43                      | 44.36                     | 54         | -9.64       | H         | 150     | 0            | LF/NF                      | Compliant |
| 12205           | 57.04                      | 44.53                     | 54         | -9.47       | H         | 150     | 0            | MF/NF                      | Compliant |
| 12400           | 56.79                      | 43.80                     | 54         | -10.20      | H         | 120     | 0            | HF/NF                      | Compliant |
| 19216           | 52.84                      | 40.61                     | 54         | -13.39      | V         | 100     | 0            | LF/NF                      | Compliant |
| 19528           | 54.44                      | 44.21                     | 54         | -9.79       | V         | 100     | 0            | MF/NF                      | Compliant |
| 19840           | 54.21                      | 41.68                     | 54         | -12.32      | H         | 100     | 0            | HF/NF                      | Compliant |
| 22320           | 55.56                      | 43.43                     | 54         | -10.57      | H         | 100     | 0            | HF/NF                      | Compliant |

<sup>1</sup> All correction factors are included in the measurement values.

<sup>2</sup> LF = Low Frequency, MF = Middle Frequency, HF = High Frequency.

<sup>3</sup> NF = Test equipment noise floor.

### 6.10. Spurious Radiated Emissions (26 MHz to 1 GHz) Test Results (15.209),

#### IC RSS-GEN

##### 6.10.1.1. Regulatory Limit: FCC Part 15.209

| Frequency Range (MHz) | Distance (Meters) | Limit (dBμV/m) |
|-----------------------|-------------------|----------------|
| 26 to 30              | 3                 | 69.5           |
| 30 to 88              | 3                 | 40.0           |
| 88 to 216             | 3                 | 43.5           |
| 216 to 960            | 3                 | 46.0           |
| 960 to 1000           | 3                 | 54.0           |
| > 1000                | 3                 | 54.0           |

##### 6.10.1.2. Test Procedure

Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

Test Number: 179-11R4

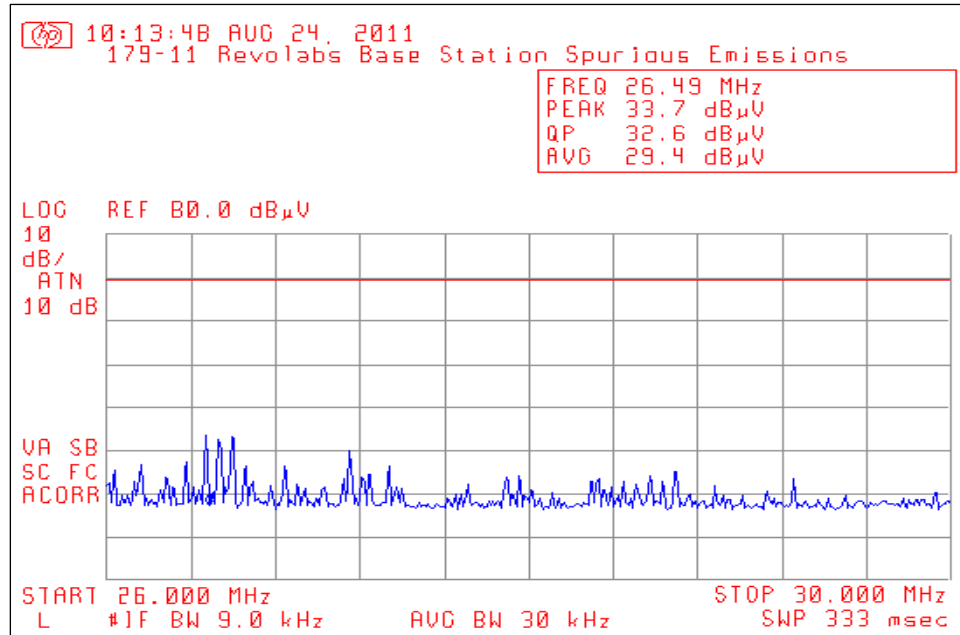
Issue Date: 8/24/2011

## 6. Measurement Data (continued)

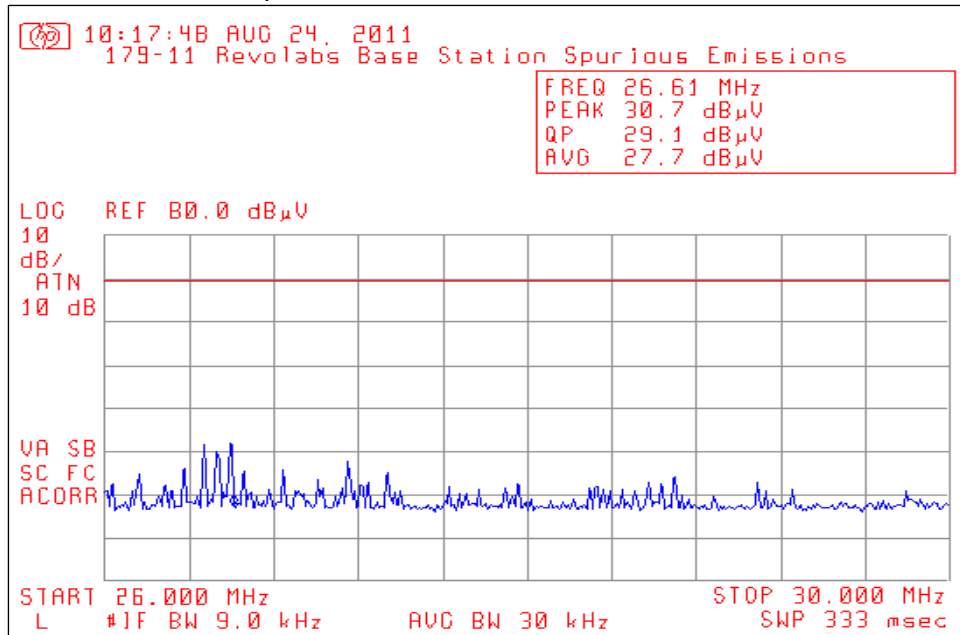
### 6.10. Spurious Radiated Emissions (26 MHz to 30 MHz) Test Results (15.209),

#### IC RSS-GEN

##### 6.10.2. Antenna Parallel to the Device Under Test



##### 6.10.3. Antenna Perpendicular to the Device Under Test



Result: Compliant

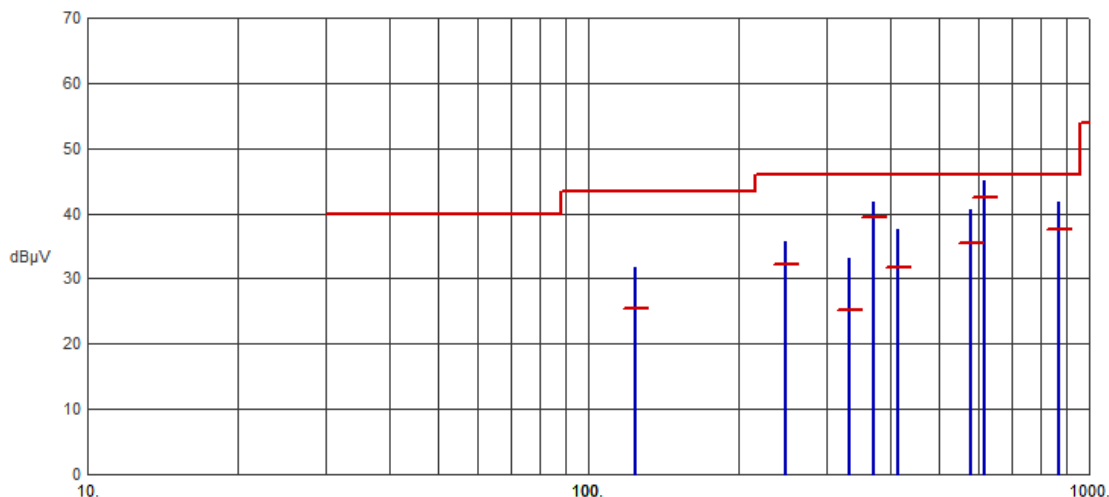
## 6. Measurement Data (continued)

### 6.10. Spurious Radiated Emissions (30 MHz to 1 GHz) Test Results (15.209), IC RSS-GEN

#### 6.10.3. Horizontal Polarity

Test No.: 179.11, Radiated Emissions - Horizontal Polarity

FCC Part 15.209



| Frequency (MHz) | Pk Amp (dBμV/m) | QP Amp (dBμV/m) | QP Limit (dBμV/m) | Margin (dB) | Ant Ht (cm) | Table (Deg) | Comments |
|-----------------|-----------------|-----------------|-------------------|-------------|-------------|-------------|----------|
| 123.9874        | 31.74           | 25.42           | 43.50             | -18.08      | N/A         | N/A         |          |
| 248.0062        | 35.71           | 32.22           | 46.00             | -13.78      | N/A         | N/A         |          |
| 331.7923        | 33.17           | 25.24           | 46.00             | -20.76      | N/A         | N/A         |          |
| 372.0214        | 41.67           | 39.41           | 46.00             | -6.59       | N/A         | N/A         |          |
| 414.2886        | 37.67           | 31.85           | 46.00             | -14.15      | N/A         | N/A         |          |
| 581.3001        | 40.49           | 35.37           | 46.00             | -10.63      | N/A         | N/A         |          |
| 620.0233        | 44.93           | 42.46           | 46.00             | -3.54       | N/A         | N/A         |          |
| 868.0556        | 41.69           | 37.65           | 46.00             | -8.35       | N/A         | N/A         |          |

Result: Compliant

## 6. Measurement Data (continued)

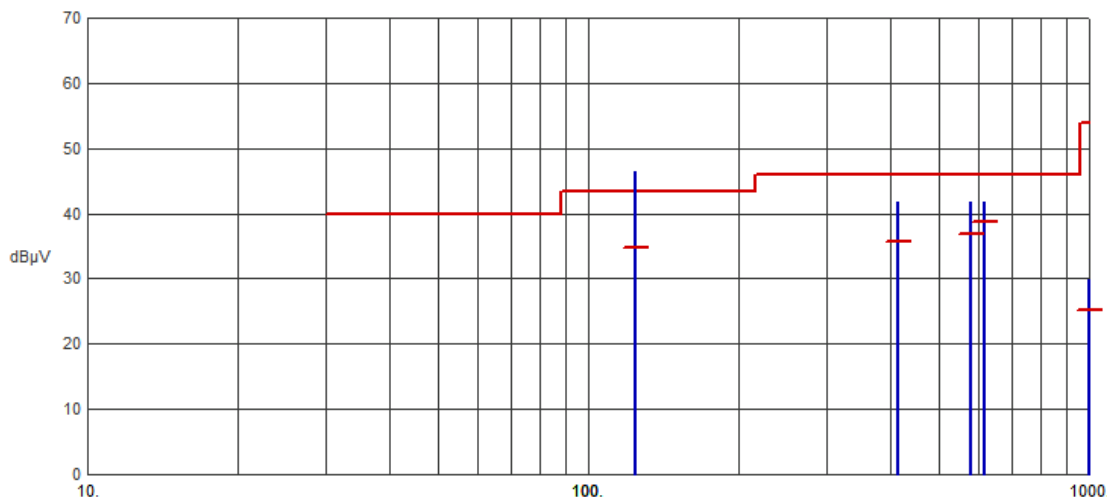
### 6.10. Spurious Radiated Emissions (30 MHz to 1 GHz) Test Results (15.209),

#### IC RSS-GEN

#### 6.10.4. Vertical Polarity

Test No.: 179.11, Radiated Emissions - Vertical Polarity

FCC Part 15.209



| Frequency (MHz) | Pk Amp (dBμV/m) | QP Amp (dBμV/m) | QP Limit (dBμV/m) | Margin (dB) | Ant Ht (cm) | Table (Deg) | Comments |
|-----------------|-----------------|-----------------|-------------------|-------------|-------------|-------------|----------|
| 123.9984        | 46.32           | 34.84           | 43.50             | -8.66       | N/A         | N/A         |          |
| 415.2642        | 41.82           | 35.80           | 46.00             | -10.20      | N/A         | N/A         |          |
| 579.8525        | 41.82           | 36.91           | 46.00             | -9.09       | N/A         | N/A         |          |
| 620.0114        | 41.72           | 38.62           | 46.00             | -7.38       | N/A         | N/A         |          |
| 999.5948        | 29.80           | 25.17           | 54.00             | -28.83      | N/A         | N/A         |          |

Result: Compliant

#### 6.10.5. Spurious Emissions >1 GHz

There were no measureable spurious emissions other than the emissions outlined in Section 6.9.

## 6. Measurement Data (continued)

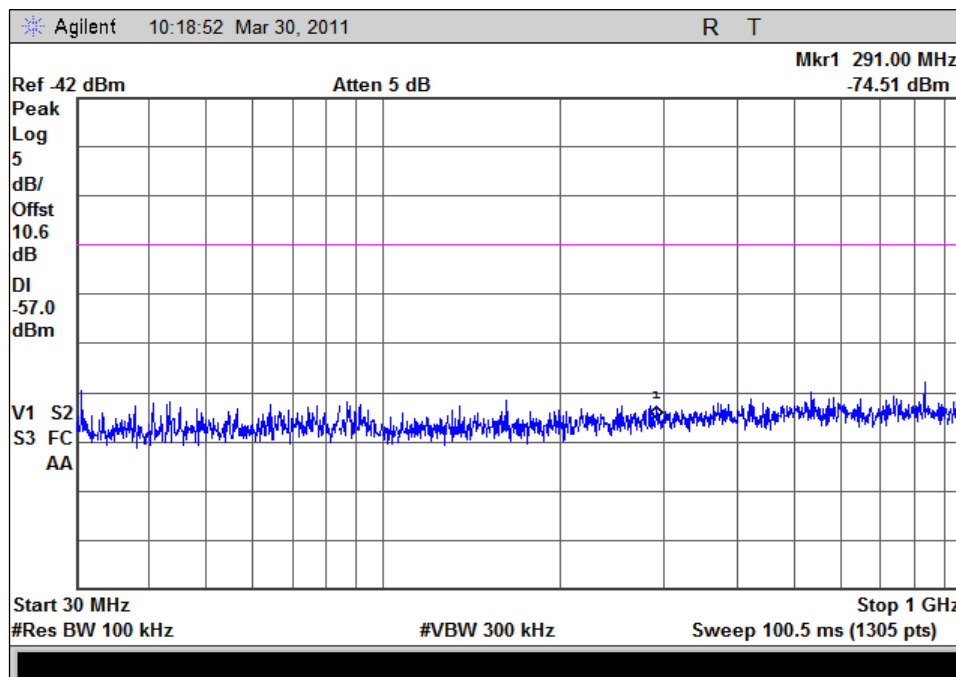
### 6.11. Receiver Spurious Emissions (RSS 213 6.8, RSS-GEN 4.10 & 6.2)

Requirement: RSS 213 6.8 - Receiver spurious emissions shall comply with the limits specified in RSS-Gen.

RSS-GEN 4.10 – Radiated emission measurements are to be performed using a calibrated open-area test site. As an alternative, the conducted measurement method may be used when the antenna is detachable. In such a case, the receiver spurious signal may be measured at the antenna port. The limits for this measurement were taken from section 6.2:

|            |                 |
|------------|-----------------|
| 2 $\eta$ W | 30 MHz to 1 GHz |
| 5 $\eta$ W | above 1 GHz     |

#### 6.11.1. Receiver Spurious Emissions, 30 MHz to 1 GHz



Result: Compliant

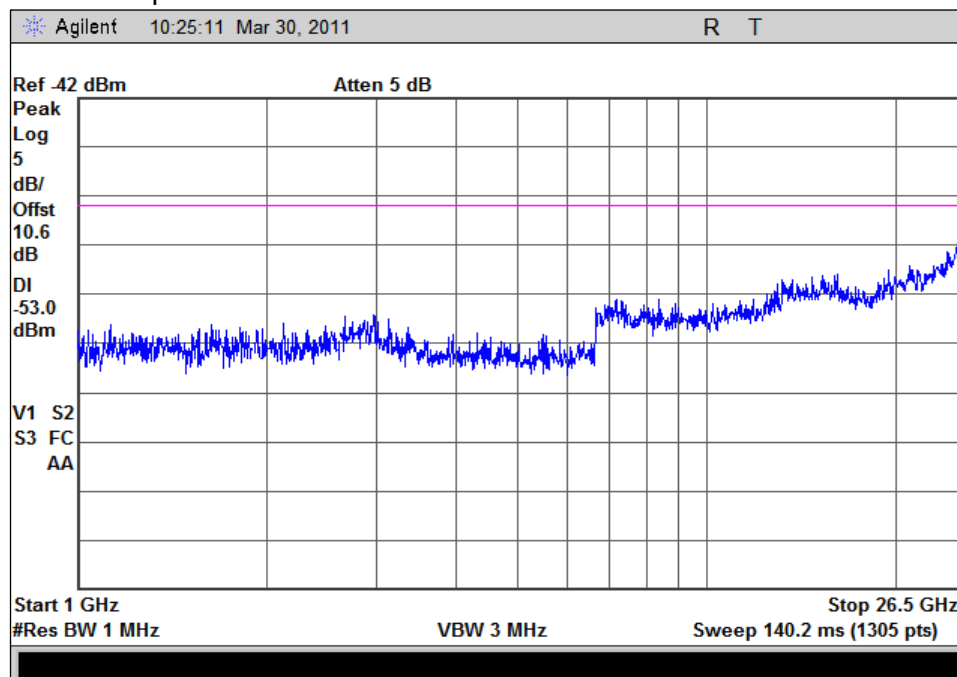
Test Number: 179-11R4

Issue Date: 8/24/2011

## 6. Measurement Data (continued)

### 6.11. Receiver Spurious Emissions (RSS 213 6.8, RSS-GEN 4.10 & 6.2)

#### 6.11.2. Receiver Spurious Emissions above 1 GHz



Result: Compliant

**6. Measurement Data (continued)**
**6.12. Power Line Conducted Emissions (15.207), IC RSS-GEN**

**Requirement:** For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

**Test Note:** A Teking Model PAS05AA-W0050 1000 5 Volt, 1 Amp linear power adapter was used to power the device under test for conducted emissions testing.

**6.12.1 Power Line Conducted Emissions Test Setup**
**6.12.1.1 Regulatory Limit: (15.207) (FCC Part 15, Class B)**

| Frequency Range<br>(MHz)                         | Limits<br>(dB $\mu$ V) |           |
|--------------------------------------------------|------------------------|-----------|
|                                                  | Quasi-Peak             | Average   |
| 0.15 to 0.50                                     | 66 to 56*              | 56 to 46* |
| 0.50 to 5.0                                      | 56                     | 46        |
| 5.0 to 30.0                                      | 60                     | 50        |
| * Decreases with the logarithm of the frequency. |                        |           |

**6.12.1.2. Test Procedure**

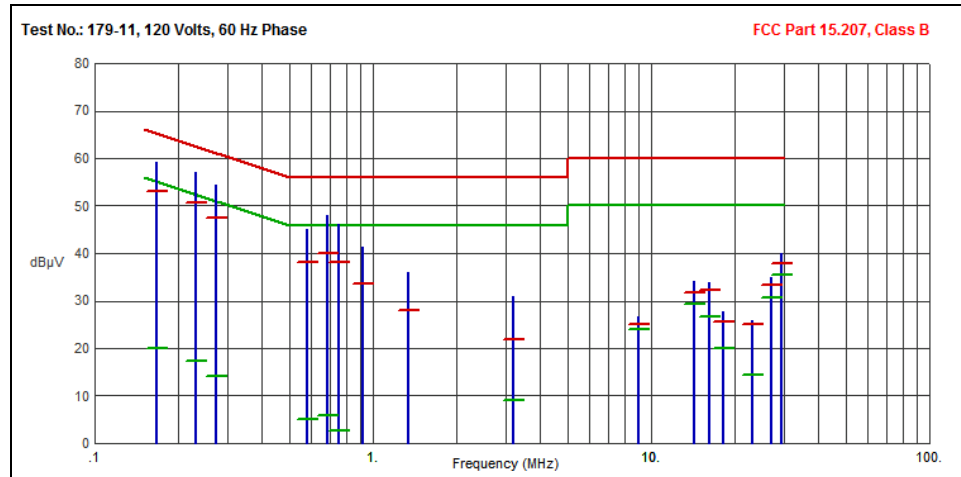
Test measurements were made in accordance with ANSI C63.4-2009, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

## 6. Measurement Data (continued)

### 6.12. Power Line Conducted Emissions (15.207, IC RSS-GEN)

#### 6.12.2 Conducted Emissions Test Data

##### 6.12.2.1 120 Volts, 60 Hz Phase



| Frequency (MHz) | Pk Amp (dBµV) | QP Amp (dBµV) | QP Limit (dBµV) | QP Margin (dB) | Avg Amp (dBµV) | Avg Limit (dBµV) | Avg Margin (dB) | Comments |
|-----------------|---------------|---------------|-----------------|----------------|----------------|------------------|-----------------|----------|
| .1669           | 59.30         | 53.16         | 65.11           | -11.95         | 19.93          | 55.11            | -35.18          |          |
| .2301           | 57.11         | 50.65         | 62.45           | -11.80         | 17.34          | 52.45            | -35.11          |          |
| .2729           | 54.36         | 47.53         | 61.03           | -13.50         | 14.16          | 51.03            | -36.87          |          |
| .5776           | 45.00         | 38.20         | 56.00           | -17.80         | 5.14           | 46.00            | -40.86          |          |
| .6869           | 47.88         | 40.05         | 56.00           | -15.95         | 5.79           | 46.00            | -40.21          |          |
| .7521           | 46.04         | 38.19         | 56.00           | -17.81         | 2.55           | 46.00            | -43.45          |          |
| .9202           | 41.33         | 33.51         | 56.00           | -22.49         | -1.57          | 46.00            | -47.57          |          |
| 1.3465          | 35.88         | 28.08         | 56.00           | -27.92         | -5.54          | 46.00            | -51.54          |          |
| 3.1819          | 30.89         | 21.77         | 56.00           | -34.23         | 9.10           | 46.00            | -36.90          |          |
| 9.0011          | 26.64         | 25.18         | 60.00           | -34.82         | 23.87          | 50.00            | -26.13          |          |
| 14.2140         | 34.00         | 31.76         | 60.00           | -28.24         | 29.45          | 50.00            | -20.55          |          |
| 16.1676         | 33.78         | 32.28         | 60.00           | -27.72         | 26.55          | 50.00            | -23.45          |          |
| 18.2445         | 27.68         | 25.60         | 60.00           | -34.40         | 20.11          | 50.00            | -29.89          |          |
| 23.1311         | 25.95         | 24.95         | 60.00           | -35.05         | 14.42          | 50.00            | -35.58          |          |
| 27.1613         | 34.98         | 33.22         | 60.00           | -26.78         | 30.63          | 50.00            | -19.37          |          |
| 29.2371         | 39.91         | 37.96         | 60.00           | -22.04         | 35.40          | 50.00            | -14.60          |          |

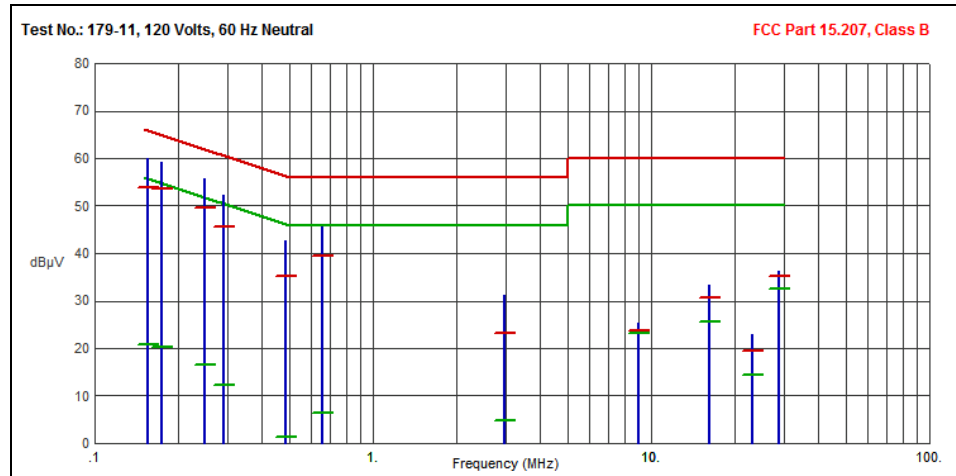
Result: Compliant

## 6. Measurement Data (continued)

### 6.12. Power Line Conducted Emissions (15.207), IC RSS-GEN

#### 6.12.2. Conducted Emissions Test Data (continued)

##### 6.12.2.2 120 Volts, 60 Hz Neutral



| Frequency (MHz) | Pk Amp (dBμV) | QP Amp (dBμV) | QP Limit (dBμV) | QP Margin (dB) | Avg Amp (dBμV) | Avg Limit (dBμV) | Avg Margin (dB) | Comments |
|-----------------|---------------|---------------|-----------------|----------------|----------------|------------------|-----------------|----------|
| .1560           | 59.88         | 53.91         | 65.67           | -11.76         | 20.80          | 55.67            | -34.87          |          |
| .1743           | 59.28         | 53.48         | 64.75           | -11.27         | 20.34          | 54.75            | -34.41          |          |
| .2482           | 55.85         | 49.68         | 61.82           | -12.14         | 16.45          | 51.82            | -35.37          |          |
| .2901           | 52.35         | 45.61         | 60.52           | -14.91         | 12.31          | 50.52            | -38.21          |          |
| .4849           | 42.79         | 35.12         | 56.25           | -21.13         | 1.46           | 46.25            | -44.79          |          |
| .6568           | 45.69         | 39.45         | 56.00           | -16.55         | 6.34           | 46.00            | -39.66          |          |
| 2.9762          | 31.30         | 23.09         | 56.00           | -32.91         | 4.70           | 46.00            | -41.30          |          |
| 9.0010          | 25.28         | 23.70         | 60.00           | -36.30         | 23.07          | 50.00            | -26.93          |          |
| 16.2281         | 33.40         | 30.78         | 60.00           | -29.22         | 25.65          | 50.00            | -24.35          |          |
| 23.1272         | 22.83         | 19.38         | 60.00           | -40.62         | 14.46          | 50.00            | -35.54          |          |
| 28.6873         | 36.28         | 35.28         | 60.00           | -24.72         | 32.57          | 50.00            | -17.43          |          |

Result: Compliant

## 6. Measurement Data (continued)

### 6.13. Public Exposure to Radio Frequency Energy Levels (15.247(i) (1.1307 (b)(1)) RSS-GEN 5.5, RSS 102

| Channel Frequency | MPE Distance (cm) | DUT Output Power (dBm) | DUT Antenna Gain (dBi) | Power Density         |                     | Limit (mW/cm <sup>2</sup> ) | Result    |
|-------------------|-------------------|------------------------|------------------------|-----------------------|---------------------|-----------------------------|-----------|
|                   |                   |                        |                        | (mW/cm <sup>2</sup> ) | (W/m <sup>2</sup> ) |                             |           |
|                   | (1)               | (2)                    | (3)                    | (4)                   |                     | (5)                         |           |
| 2402              | 20.0              | 3.512                  | 2.0                    | 0.0007111             | 0.0071110           | 1                           | Compliant |
| 2441              | 20.0              | 3.296                  | 2.0                    | 0.0006766             | 0.0067660           | 1                           | Compliant |
| 2480              | 20.0              | 3.257                  | 2.0                    | 0.0006705             | 0.0067055           | 1                           | Compliant |

$$PD = \frac{OP + AG}{(4 \times \pi \times d^2)}$$

- PD = Power Density (mW/cm<sup>2</sup>)
- OP = DUT Output Power (dBm)
- AG = DUT Antenna Gain (dBi)
- d = MPE Distance (cm)

- Reference CFR 2.1093(b): For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.
- Section 6.6 of this test report.
- Antenna gain is calculated from the measured field strength and maximum peak conducted output power.
- Power density is calculated from power measurement and antenna gain.
- Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure.

**6. Measurement Data (continued)****6.13. Public Exposure to Radio Frequency Energy Levels (15.247(i) (1.1307 (b)(1))  
RSS-GEN 5.5, RSS 102**

| Channel | Channel Frequency (MHz) | Measured Power (dBm) | Measured Output Power (mW) |
|---------|-------------------------|----------------------|----------------------------|
| Low     | 2402                    | 3.51                 | 2.2449                     |
| Middle  | 2441                    | 3.30                 | 2.1360                     |
| High    | 2480                    | 3.26                 | 2.1169                     |

**RSS-102 Section 2.5, 2.5.1 & 2.5.2 Requirements:**

2.5 - All transmitters are exempt from routine SAR and RF exposure evaluations provided that output power complies with the power levels of sections 2.5.1 or 2.5.2. If the equipment under test (EUT) meets the requirements of sections 2.5.1 or 2.5.2, applicants are only required to submit a properly signed declaration of compliance (see Annex C).

2.5.1 - SAR evaluation is required if the separation distance between the user and the radiating element of the device is less than or equal to 20 cm, except when the device operates as follows:

- above 2.2 GHz and up to 3 GHz inclusively, and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 20 mW for general public use and 100 mW for controlled use

2.5.2 - RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W.

**7. Test Site Description**

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with Federal Communications Commission (FCC) and Industry Canada standards. A description of the test sites is on file with the FCC (registration number **96392**) and Industry Canada (file number **IC 3023A-1**).

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane required by EN 55022.

Both sites are designed to test products or systems 1.5 meter W x 1.5 meter L x 2.0 meter H, floor standing or table top.